DEVICE RELATED DISTRACTION MEASUREMENT: Preliminary Findings and Research Challenges

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Background

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- **Driver distraction is a known safety problem**
  - 20-30% of crashes involved distraction (NASS CDS 95-98)
- **New communication and information technologies have potential safety and social benefits**
- **However, new devices may worsen the distraction problem**

Distraction Assessment Research Methods

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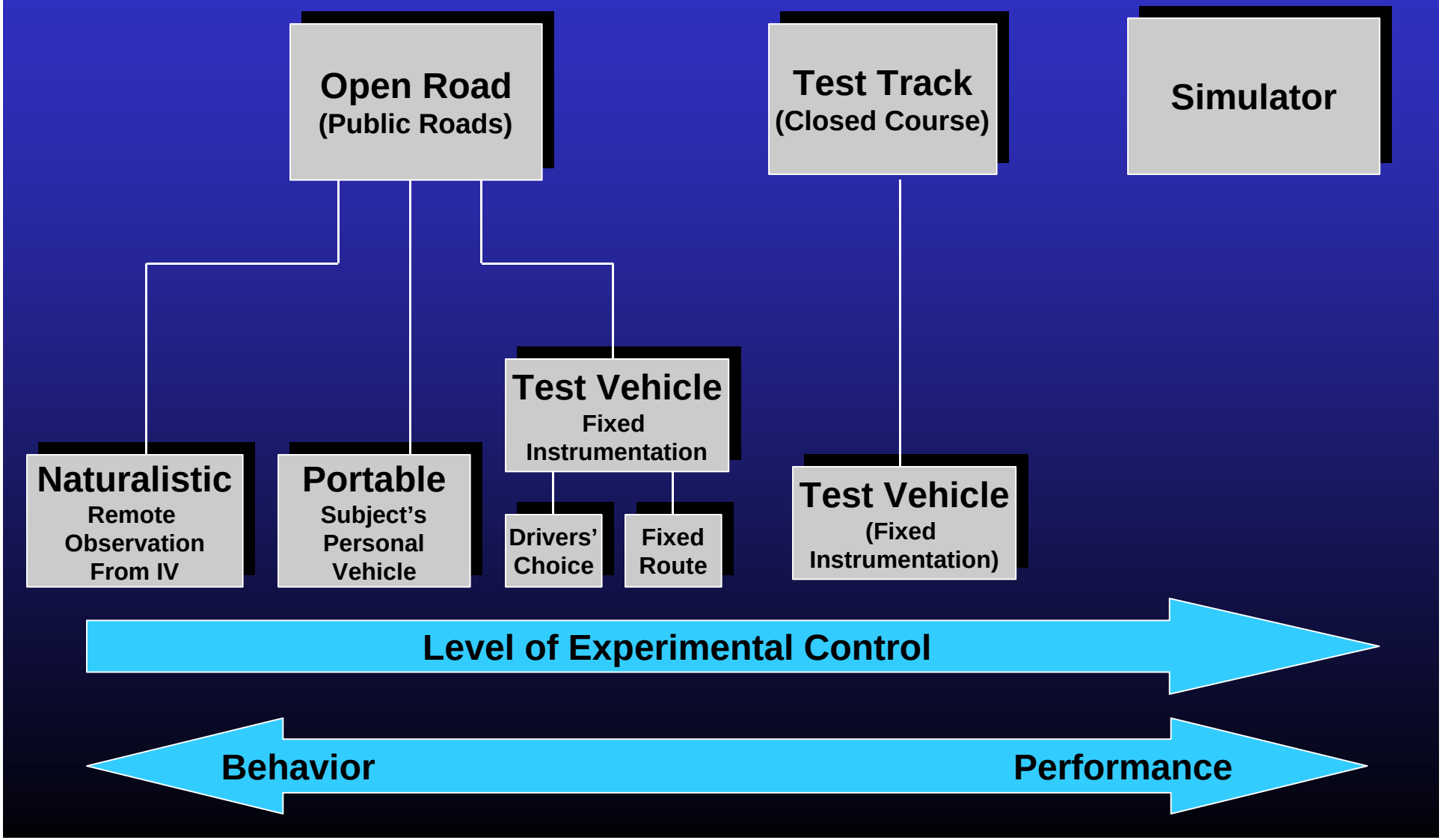

NHTSA Research Program

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- On-road studies
- Test track studies
- NADS studies

Wireless Telephone Interface Study

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- **Instrumented vehicles driven by members of general public for 6 weeks**
  - 3 wireless phone interfaces
    - Hand-held, hands-free, hands-free with voice dialing
  - 2 weeks per phone interface
- **Compare for different interface designs:**
  - Use patterns
  - Conditions under which drivers are willing to use wireless phones

Research Challenges – Wireless Phone Study

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- **Management of large data sets**
- **Identify valid calls made while driving**

Data Reduction Effort

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Phone Call Breakdown (Phase One)

Type of Call / Condition	Hand-Held Phone	Conventional Hands-Free Phone	Totally Hands-Free Phone
Made by Driver While Driving	123	148	82
Made by Driver, Wrong Interface	1	35	3
Made by Driver, Stationary Vehicle	45	43	18
Made by Passenger	3	2	2
Other	4	0	1
TOTAL	176	228	106
% Usable Calls	70%	65%	77%

Preliminary Phone Call Data

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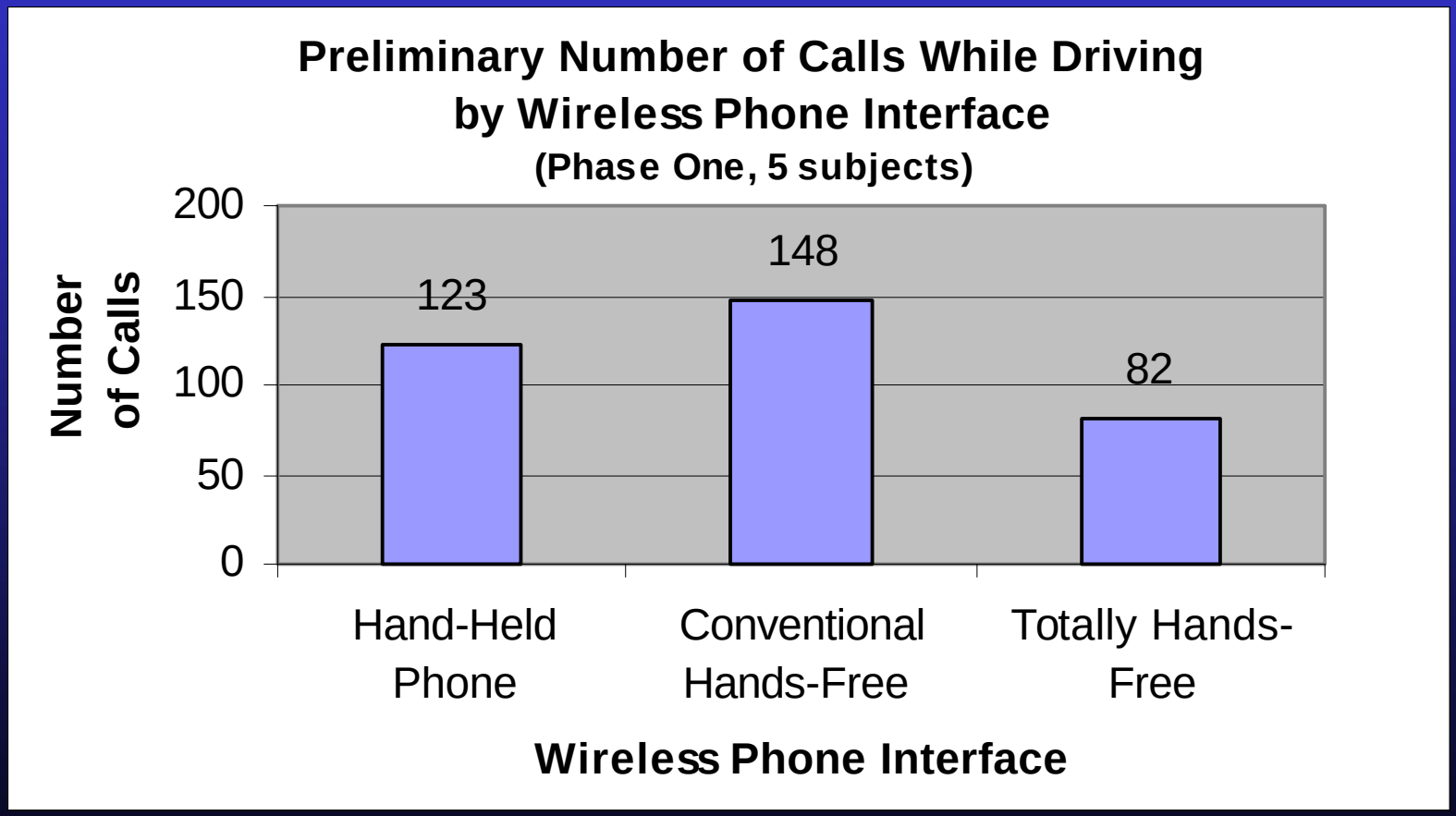

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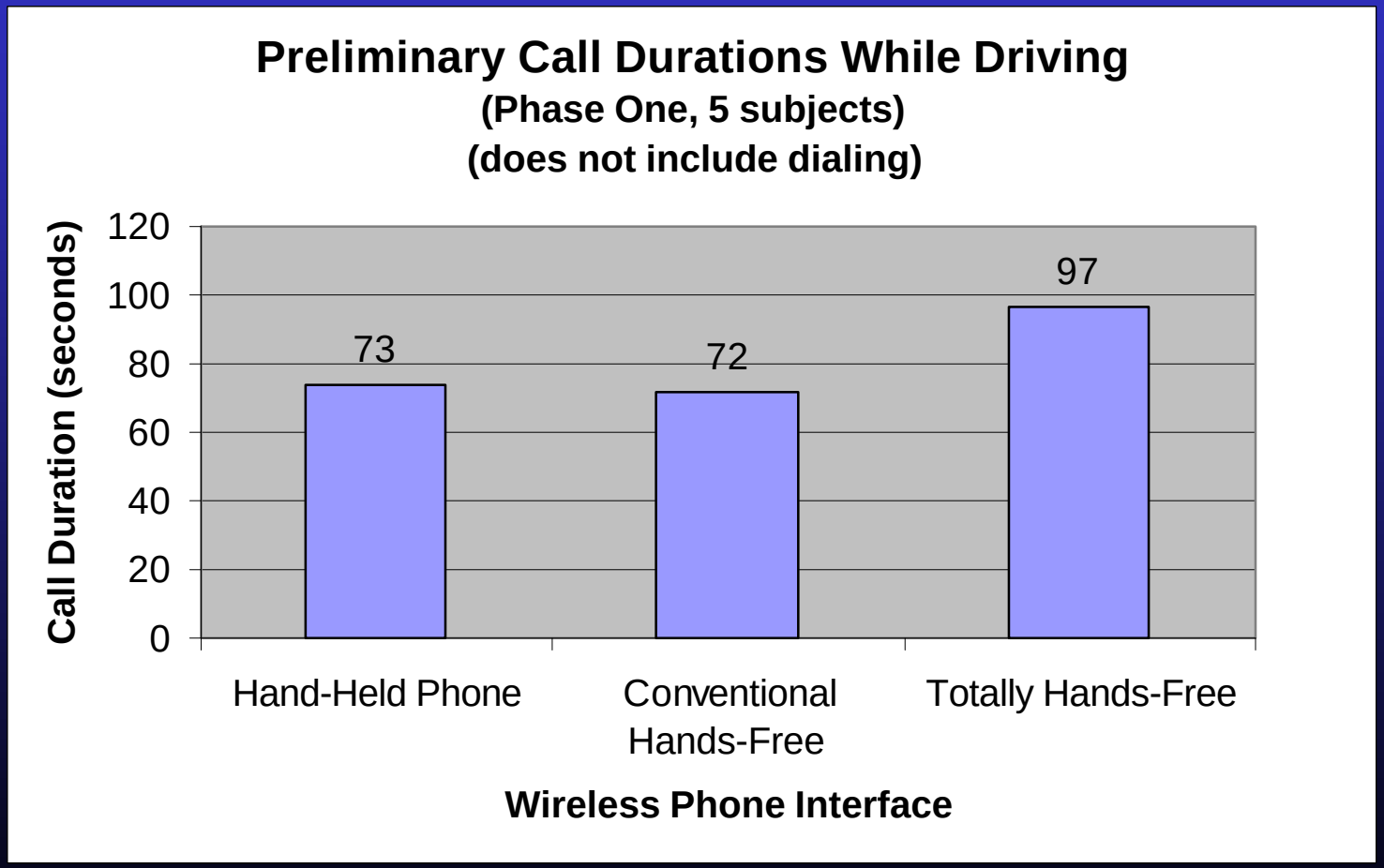

Research Challenges – Wireless Phone Study

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- **Data loss due to field study issues**
- **Match exposure between conditions**
- **Recruitment issues, self-reporting**

Preliminary Phone Call Data

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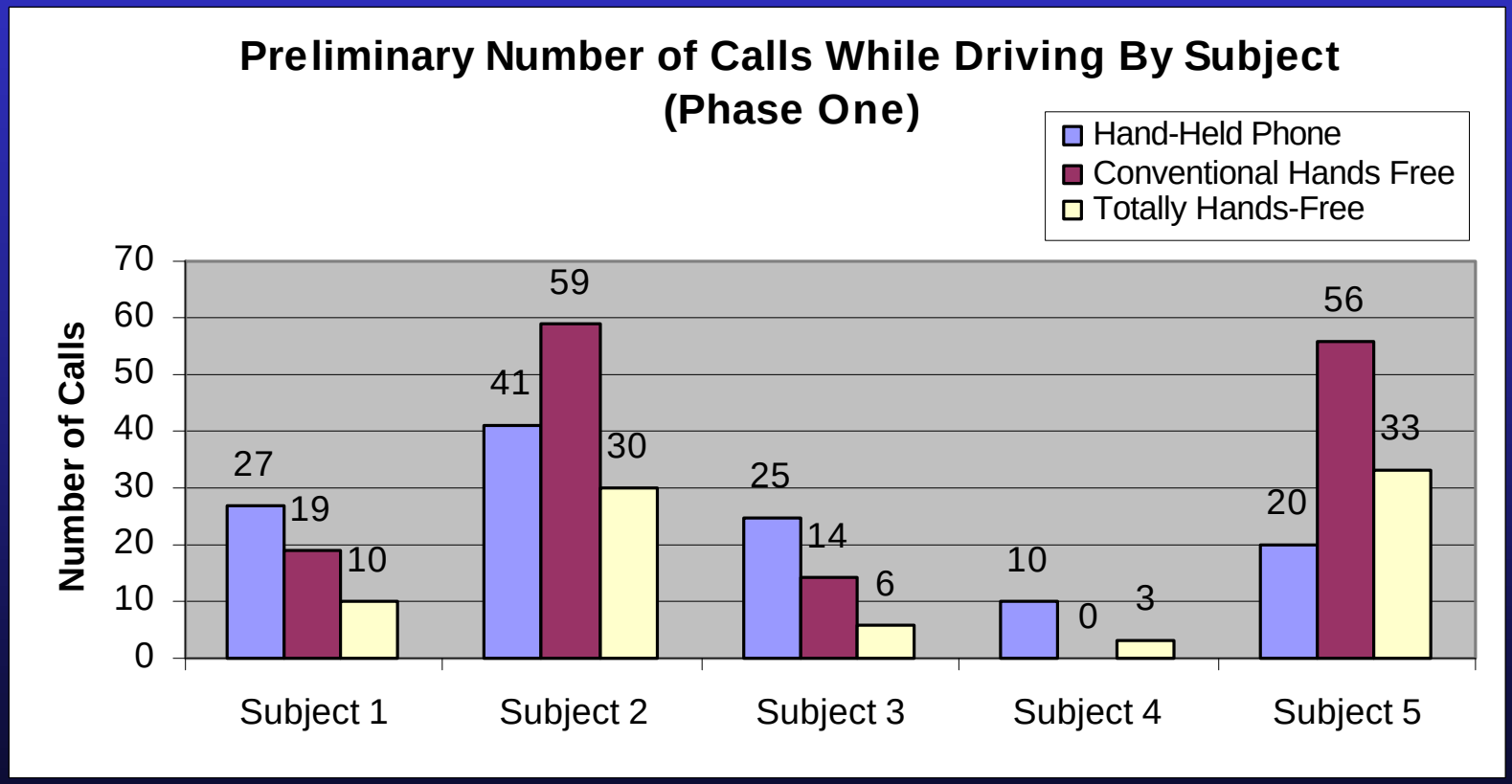

Lessons Learned – Wireless Phone Study

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- **Selective recruitment for naturalistic studies**
- **Use of event markers in data**

Test Track Studies

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- **Evaluation of voice interface for in-vehicle devices**
- **Demonstration study of everyday distractions**

Effects of Voice Technology on Test Track Driving Performance

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- **Cooperative study between NHTSA and Transport Canada**
- **Compare voice and non-voice technologies for:**
  - Phone dialing
  - Radio tuning
  - E-mail retrieval

Effects of Voice Technology on Test Track Driving Performance

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- **Driving performance and eye glance behavior will be analyzed**
- **Results will help determine what tasks are appropriate for drivers to access while driving on public roads**

Research Challenges – Voice Interface Test Track Study

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- **Conducting research in experimental settings removes drivers' motives and reasons for engaging in distracting behaviors**
- **Cannot recreate the visual and operational richness of on-road conditions**
- **Research limited to distraction potential**

Demonstration Study of Everyday Distractions

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- Closed-course study to assess effects of various secondary tasks on driving performance
- Subjects drove repeated laps over winding road course
- Unexpected events combined with everyday in-vehicle distractions
- Separate scores for primary (driving) and secondary (distracting) tasks

Results Based on Test Scores

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- **Based on examination of 12 subjects:**
  - On average, performing a secondary task was associated with a 15% reduction in driving performance, relative to the average baseline score
  - On 88% of all driving laps, the secondary task impaired driving performance.

Cost of Performing Secondary Tasks while Driving

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Task	Average Performance Decrement (%)
Counting	12
Reading	16
List Writing	25
Phone Dialing	8
Grooming/Eating	12
Destination Entry	18
CD Changing	17
Mean for all secondary tasks	15

Research Challenges – Demonstration Study of Everyday Distractions

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- **Development of closed course distraction assessment test concept**
- **Development of unexpected events**
- **Timing of unexpected events**

Demonstration Study of Everyday Distractions

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Research Challenges – Demonstration Study of Everyday Distractions

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- **Creation of incentives for secondary task performance**
- **Development of metrics for assessing performance**

Lessons Learned – Test Track Distraction Studies

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- **Scoring and competitiveness can be used to create incentive for task performance**
- **Typical roadway traffic control devices can be used to create a more realistic visual environment**

NADS Research

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- **National Advanced Driving Simulator (NADS)**

NADS Studies

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- **Driver workload and distraction**
  - Due to Wireless Communications Devices
  - Due to In-Vehicle Information Systems

Research Challenges – NADS Distraction Studies

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- **Acclimation to simulator and devices while driving is limited due to cost**
- **Creation of incentives for secondary task performance**
- **How to create compelling conversation**
- **NADS validation**

Overall Research Challenges

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- **Selecting appropriate research tool**
  - Experimental methods trade realism for control
  - Naturalistic methods can lack control necessary to provide definitive answers to questions
- **Relating findings to potential safety impact**

Conclusions

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- **Understanding distraction requires a coordinated research program:**
  - Naturalistic studies to evaluate drivers' willingness to engage in distracting activities under normal driving conditions and resulting errors
  - On-road experiments to understand distraction potential in routine situations
  - Closed-course experiments to understand distraction potential in routine and near-critical situations
  - Simulator studies to understand distraction effects in near-critical and critical situations

Conclusions

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- **Research program will attempt to:**
  - **Determine safety implications of device use under various conditions**
  - **Develop guidelines for their performance features and appropriate use in vehicles**
  - **Investigate integrating collision avoidance systems with information and communication technologies to mitigate their distracting effects**
  - **Quantify benefits and risks**